PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to Aircraft Jet Engine Cooling System

We, NORTHROP AIRCRAFT, INC., a corporation organised under the laws of the State of California, of Northrop Field, Hawthorne, California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to jet engine cooling systems, and more particularly, to such a cooling system for use when the jet engine is installed in high speed aircraft.

The present invention provides an airplane having a gas turbine engine, in which a cooling system is provided including a ram air duct connected with the air inlet end of said engine having a negative pressure therein when said engine is running in the absence of ram, and a positive pressure therein when the airplane is in flight, a cooling shroud spaced from and surrounding at least a portion of the said engine to form an engine cooling space, said shroud extending rearwardly beyond a jet exhaust opening to form a negative pressure space in said shroud adjacent said latter opening when the engine is running, the space between the shroud and the engine being forwardly connected to said ram air duct and rearwardly to the jet exhaust opening, and means admitting cooling air at substantially zero pressure to said shroud when both said forward connection and rear end of said shroud are at a negative pressure.

It is customary, when jet engines are installed in aircraft, to terminate the jet tail pipe just short of an engine encircling shroud spaced from the engine casing; this arrangement causes a negative pressure to be created at the rear end of the shroud. Air is customarily admitted between the shroud and the engine, ahead of the combustion chambers, turbine, and tail pipe of the engine through an airscoop. During flight, a ram pressure is developed in the airscoop which, combined with the negative pressure at the exhaust end of the engine, causes a satisfactory cooling flow of air to pass through the shroud. On the ground, however, and at low airplane speeds, ram pressure is absent or very small, and the cooling flow is substantially entirely dependent upon the negative pressure developed by the ejector action of the jet.

On very high speed airplanes, the drag of special engine cooling airscoops is undesirable, and it is advantageous to take the engine cooling air from the jet engine inlet duct, thereby completely eliminating the special cooling airscoop. The action of such a cooling air inlet is satisfactory as long as positive ram pressure is obtained in the jet inlet, such as will exist when the aircraft is in flight, but is not satisfactory when the engine is running on the ground or at low aircraft speeds. This is because the suction developed by the compressor of the jet engine causes a negative pressure to be created in the jet engine inlet duct and at the inlet to the cooling air supply duct. When, then, one end of the space between shroud and engine is connected to the jet engine inlet, with the other end extending beyond the jet engine exhaust opening, negative pressures will exist at both places in the absence of ram, and very little, if any, cooling air flow will result.

It is an object of the present invention to provide a means and method of obtaining a satisfactory cooling air flow around a jet engine when the inlet for the cooling air flow is common with the inlet to the jet engine.

In brief, the present invention includes a shroud around the rear portions of a jet engine as installed in an aircraft. The aft end of the shroud is positioned so that a negative pressure is developed therein between the engine and the shroud due to ejector action of the jet exhaust. The inlet to the shroud is connected to the main air inlet to the compressor of the jet engine in a position where

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